

WHAT IS CLAIMED IS:

- 1 1. A computer-implemented method for separating a tooth from adjacent
2 structure, comprising:
 - 3 defining a cutting surface; and
 - 4 applying the cutting surface between the tooth and the structure to separate the
5 tooth from the structure in a single cut.
- 1 2. The method of claim 1, wherein the cutting surface is curved.
- 1 3. The method of claim 1, wherein the cutting surface is expressed as a
2 function.
- 1 4. The method of claim 1, wherein the cutting surface is expressed as a
2 spline function and a quadratic function.
- 1 5. The method of claim 1, wherein the cutting surface is expressed as a
2 spline function and a parabolic function.
- 1 6. The method of claim 1, wherein the cutting surface is interactively
2 adjusted.
- 1 7. The method of claim 4, wherein the interactive adjustment of the
2 cutting surface modifies a function defining the cutting surface.
- 1 8. The method of claim 4, further comprising interactively highlighting
2 the separated portion.
- 1 9. The method of claim 8, further comprising interactively highlighting
2 the border of the separated portion.
- 1 10. The method of claim 1, wherein the cutting surface is defined by
2 specifying a basis for the tooth.
- 1 11. The method of claim 1, wherein the structure is a gingiva, further
2 comprising finding a line between a tooth surface and the gingiva and applying the cutting
3 surface to said line.

1 12. The method of claim 11, further comprising finding a high curvature
2 location on the tooth surface.

1 13. The method of claim 11, further comprising fitting a spline to the line.

1 14. The method of claim 1, wherein the cutting surface further comprises a
2 plurality of surfaces.

1 15. The method of claim 14, wherein the root of the tooth is modeled as a
2 parabolic surface below a gingival line.

1 16. The method of claim 14, further comprising defining an enclosing
2 surface to enclose the crown of the tooth.

1 17. The method of claim 14, further comprising:
2 displaying the surface specified with a plurality of nodes;
3 adjusting one or more nodes to modify the surface; and
4 applying the surface to separate the gingiva from the tooth.

1 18. The method of claim 17, further comprising providing a handle to
2 adjust each orientation of the cutting shape.

1 19. The method of claim 17, wherein adjusting one or more nodes further
2 comprises moving one or more nodes.

1 20. The method of claim 17, wherein the cutting surface is formed using a
2 function in a cylindrical coordinate system.

1 21. A system for separating a tooth from adjacent structure, comprising:
2 means for defining a cutting surface; and
3 means for applying the cutting surface between the tooth and the structure to
4 separate the tooth from the structure in a single cut.

1 22. A computer program, residing on a tangible storage medium, for use in
2 separating a computer model of a tooth from a computer model of a dental structure, the
3 program comprising executable instructions operable to cause a computer to:
4 define a cutting surface; and

5 apply the cutting surface between the tooth and the structure to separate the
6 tooth from the structure in a single cut.

1 23. A computer program, residing on a tangible storage medium, for use in
2 separating a computer model of a tooth from a computer model of a dental structure, the
3 program comprising executable instructions operable to cause a computer to:

4 define a cutting surface, wherein the cutting surface is expressed as a spline
5 function and a quadratic function; and

6 apply the cutting surface between the computer model of the tooth and the
7 computer model of the dental structure to separate the computer model in a single cut.

1 24. A computer, comprising:

2 a processor;

3 a data storage device coupled to the processor, the data storage device
4 containing code for use in separating a computer model of a tooth from a computer model of
5 an adjacent dental structure, the program comprising executable instructions operable to
6 cause a computer to:

7 define a cutting surface, wherein the cutting surface is expressed as a spline
8 function and a quadratic function and wherein the cutting surface further comprises a
9 plurality of surfaces and wherein the root of the tooth is modeled as a parabolic surface below
10 a gingival line; and

11 apply the cutting surface to the tooth to separate the tooth from the dental
12 structure in a single cut.

1 25. The system of claim 24, further comprising instructions to define an
2 enclosing surface to enclose the crown of the tooth.